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Springfield, VA 22151

Ms. Jacky Rosati
US Environmental Protection Agency
E-305-03 109 T.W. Alexander Drive
Research Triangle Park, NC 27711 July 21, 2005

Dear Ms. Rosati:

Attached is a *preliminary* report based on analytical data *thus far received*, for dust samples collected primarily in the New York City area. Most of the samples were taken in areas that, it is believed, were not affected by particulate matter generated during the World Trade Center (WTC) collapse (i.e., background samples). Some of the samples were spiked with one or the other of two dusts that are believed to have originated from the WTC collapse. The analytical protocol was developed by the government, specifically for this project, and was modified as the project developed. The purpose of the testing was to determine if the spiked background dusts could be distinguished from those samples that were not spiked.

Three parameters were measured to make this determination: (1) slag wool fiber content; (2) calcium-rich particle content; and (3) gypsum particle content.

The analytical data indicate that:

- With respect to calcium-rich particles and gypsum particles, spiked samples cannot readily be distinguished from background samples.
- With respect to slag wool content in the samples spiked with the first of the two WTC dusts, spikes at the 10% level may be statistically identifiable as WTC-contamination, although spikes at or below the 5% level are probably not identifiable.
- With respect to slag wool content, samples spiked with 5% and 10% of the second of the two WTC dusts are easily identifiable as WTC-contaminated. Even at the 1% spike level, samples may be statistically identifiable.

The attached *preliminary* report will explain the above conclusions in more detail. However, it must be noted that all of the analytical data from the eight laboratories that performed the analysis has not yet been received. Nevertheless, it is believed that the above conclusions will not likely change once those additional data are incorporated.

Sincerely,

Stephen M. Schwartz, P.E., Q.E.P.
Project Manager

Versar

Preliminary Report
of
Analysis of New York City Area Dust Samples

Purpose:

The objective of this study is to determine if New York City area dusts that are contaminated with varying levels of dusts known to originate from the collapse of the World Trade Center (WTC) can be distinguished from background dusts that are believed not to be contaminated with WTC dusts.

Project Summary:

In the initial portion of the testing, 10 dust samples from New York City areas that are believed not to be contaminated with dusts originating from the collapse of the WTC were used. These are referred to as the first set of *background* samples. An additional background dust sample was spiked at 1, 5, and 10 percent levels (by weight) with dust believed to have originated from the WTC collapse. An additional background sample was spiked at 1, 5, and 10 percent levels with a second dust sample that is believed to have originated from the WTC collapse. Therefore, a set of 16 samples was generated:

- 10 different background dusts
- 3 samples, each consisting of one background dust sample spiked with one source of WTC dust at 1, 5, and 10% levels
- 3 samples, each consisting of one background dust sample spiked with a second source of WTC dust at 1, 5, and 10% levels

Initially, 32 samples were sent to each of eight analytical laboratories (three U.S. government, and five private). The 32 samples consisted of two identical sets (i.e., duplicates) of the 16 samples discussed above. The private laboratories did not know that there were duplicate samples. Further, they did not know which, if any, of the samples contained WTC spikes.

Subsequently, a second set of 28 *different* background samples was analyzed to obtain a better understanding of the variability of background dusts. These 28 samples were sent to only one of the five private laboratories.

It was ultimately agreed that each of the laboratories would perform the following three Scanning Electron Microscopy-based (SEM) analyses on each of the samples they received (see Methodology and Data Analysis section):

- Slag wool fiber content (in number of fibers per gram of dust). Slag wool was a significant component of the WTC insulation material.
- Calcium-rich particle content (in area percent concentration in the SEM field). Such particles are assumed to be indicative of cement/concrete-like particles.
- Gypsum particle content (in area percent concentration in the SEM field). Such particles are assumed to be indicative of "dry wall" (i.e., gypsum-containing wall board).

Conclusions:

A number of conclusions can be drawn from the analytical results thus far obtained. It is not expected that data that are subsequently received will substantially change these conclusions. It must be noted that there are several caveats that affect the quality of the data. Those are discussed later in this report.

1. With respect to calcium-rich particles and gypsum particles, spiked samples cannot readily be distinguished from background samples.

   Tables 1 and 2 present the analytical data *thus far available* for calcium-rich and gypsum content respectively. Analysis was performed using SEM and x-ray mapping (XRM) techniques. The shaded areas represent the samples spiked with 1, 5, and 10% WTC dust. The others areas are background samples. Sample designations followed by "(1)" and "(2)" are duplicate samples. (Samples received by the laboratories had random identification numbers, so that the laboratories did not know if any samples were duplicates, nor did they know if any samples contained WTC dust.) In addition, Table 3 is the analysis of a subsequent 28 background samples, analyzed by only laboratory "B". Analysis of calcium-rich and gypsum particles for this sample set is shown on Table 3.

   The average of all background samples (including the second set of 28 samples) for calcium-rich particles is 22.3 area percent, with a high value of 66.5% and a low value of 4.2%. The average for the spiked samples is 20.7%, with the highest value being 25.9%. The 1, 5, and 10% spiked samples do not show any trend with respect to calcium-rich particle content (i.e., they do not show any increase as the spike level increases).

   The average of all background samples (including the second set of 28 samples) for gypsum particles is 11.7 area percent, with a high value of 56.5% and a low value of 0.1%. The average for the spiked samples is 9.3%, with the highest value being 32.8%. The 1,5, and 10% spiked samples do not show any trend with respect to gypsum particle content.

2. With respect to slag wool content in the samples spiked with the first of the two WTC dusts, spikes at the 10% level may be statistically identifiable as WTC-contamination, although spikes at or below the 5% level are probably not identifiable.

   Table 4 presents all the analytical data thus far available for SEM slag wool fiber analysis (as the number of slag wool fibers per gram of dust). The shaded areas represent samples that are spiked at the 1, 5, and 10% levels with WTC dust. Table 3 also presents additional slag wool fiber background-only sample data (next to last column). It can be seen from Figure 1 that for those spiked samples designated as "DB" that at the 5% spike level, the slag wool concentrations probably do not exceed one standard deviation above the average slag wool background concentration (including the Table 3 background data). However, at the 10% spike level, the slag wool concentration typically exceeds one standard deviation (see Figure 2), but never exceeds two standard deviations above the average background sample concentration. The average background concentration is about 27,400 fibers per gram. The standard deviation is about 40,100 fibers per gram.[1]

   It should be noted that there is a trend showing a clear increase in slag wool fiber concentration from the 1% to the 10% spike level (see "DB" sample shaded area on Table 4). However, the numerical values of those concentrations, as noted above, are still less than two standard deviations above the average concentration.

3. With respect to slag wool content, samples spiked with 5% and 10% of the second of the two WTC dusts are easily identifiable as WTC-contaminated. Even at the 1% spike level, samples may be statistically identifiable.

   The slag wool content data for the samples spiked with the WTC dust shown in Table 4 as "USGS" are easily identifiable. As can be seen in Figures 4 and 5, samples spiked with the USGS WTC dust at the 5 and 10% levels are essentially all more than two standard deviations above the average background sample concentration. (Average plus two standard deviations would be about 108,000 fibers per gram.[2]) At the 1% spike level though, WTC dust is more difficult to identify because the slag wool concentrations are mostly between one and two standard deviations above the average background sample (see Figure 3).

4. With respect to slag wool content, clearly, there is a large difference between the two WTC dust spikes used. In the "DB"-spiked samples, as noted above, it is expected to be more difficult to determine a significant slag wool fiber

[1] Background concentration data for this analysis excluded several samples that were known to have high slag wool content, specifically the C1-RTP samples (see Table 4), and samples C2,3,4,5,6 (see Table 3).
[2] Ibid.

concentration difference from background. The "USGS"-spiked samples clearly had significantly more slag wool fiber content than the "DB" samples.

5. Examining Tables 1, 2, and 4 and the Figures, it can be seen that the analyses for the duplicate samples rarely replicate one another. However, the variation between duplicate sample values (i.e., int***ra***lab) is about half of the variation between individual laboratory values (int***er***lab).[3]

Methodology and Data Analysis:

The analytical protocol was developed specifically for this project by one of the government laboratories, and modified by all laboratory participants at a meeting held for that purpose. All laboratory participants held weekly conference calls as the analytical program was proceeding to discuss general issues with the protocol. Additional modifications were made to the protocol based on those conference calls.

The original protocol included analysis by Polarized Light Microscopy (PLM), so data are also available for PLM analysis. The PLM analyses were curtailed because it became obvious that PLM could not adequately differentiate between fiber types. Further, total fiber concentrations were also determined, both by PLM and SEM methods, but those data are not presented in this report.

Caveats:

There are a few factors that may contribute to data uncertainty. Nevertheless, it is unlikely that these factors will alter the above major conclusions. Some of these factors are as follows:

1. As noted earlier, not all of the analytical data have been received.
2. Dust samples were collected by several methods. Evaluation of the sampling methodology was not part of the study.
3. To determine fiber concentration, fibers were counted using an SEM. Different laboratories diluted samples to different levels before counting, introducing some variability of results.
4. Laboratory equipment capabilities and personnel skills varied.

[3] For slag wool fiber analysis, the average difference between the analyses of duplicates (i.e., int***ra***lab differences) is about 50% of one standard deviation of the between-laboratories analyses (i.e., int***er***lab differences). For both calcium-rich and gypsum particle analysis the average intralab difference is 20% of the interlab difference.